THE PRECAUTIONARY PRINCIPLE IN BRAZIL POST-RIO-92: ENVIRONMENTAL IMPACT AND HUMAN HEALTH

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Introduction

Environmental Impact Assessments (EIA) documented within Environmental Impact Reports (EIR) are necessary in order to obtain licensing for certain activities throughout Brazil.

The basic structure of an EIA/EIR comprises general information, a description of the nature of the project and the affected area, an environmental diagnosis of the affected area (physical, biological and man-made), an analysis of environmental impacts, a proposal of mitigating measures, as well as follow-up and monitoring programs addressing impacts (BRAGA *et al*., 2005). In man-made environments, it is suggested that a study of the social make-up of the affected area is carried out to cover issues of health, among other factors. Viegas *et al*. (2011) analyzed the health component in six EIAs and concluded that most studies addressed health risks, although not in detail. Epidemiological and toxicological information was rarely presented and the health data used were not precise.

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Silva *et al*. (2010) analyzed the interrelationship between health, work and the environment in a study on *Refinaria do Nordeste*, and discovered that in the relevant EIA/EIR the risk analysis relating to workers, the community and public health had been postponed.

In her master's dissertation, Cancio (2008) applied a matrix as the framework for nine studies into the environmental impact of hydroelectric plants. She concluded that environmental impact assessments show "deficiencies due to the incipient approach and lack of consistency of health issues considered".

Principle 15 of the *Rio Declaration*, which emerged from the Rio-92 Conference, considers the importance of applying the Precautionary Principle in order to preserve environmental quality. Based on the *Rio Declaration*, environmental impact assessments use the Precautionary Principle to preserve the environment in situations where current scientific knowledge cannot predict potential consequences.

Stakeholders in building projects often take legal action, arguing against the application of this principle. However, jurisprudence on environmental law in favor of using the Precautionary Principle has been established at all levels, including the Federal Supreme Court.

The fact that environmental changes can cause human illness is a very strong argument against pursuing certain projects. Nevertheless, generally health impact assessments are still embryonic and do not include the application of the Precautionary Principle. It is argued that health risks caused by projects are due to emissions which are potentially harmful to health and which must be measured. However, how can emissions be measured before a project is implemented?

The final document approved at the Rio+20 Conference focuses on a political proposal which reaffirms the Rio-92 principles on sustainable development. However, it did not detail how they should be applied over time or present strategies for their implementation. The trajectory of the application of the Precautionary Principle in the 20 years following the Conference is linked to the success of its legal interpretation by environmental law and in the courts.

The present study outlines the necessary components for sustainable development based on the Rio-92 proposals. All information was obtained through a bibliographical and document analysis. These include theses, dissertations, legislation, technical reports, studies into environmental law and opinions by the Supreme Federal Court.

This study proposes that the Precautionary Principle, already applied to EIAs, should also be applied to health impact analyses. In order to do so, various topics are used to position human beings in respect to environmental law: the environment; environment as a fundamental right of man; man's cohabitation in a sustainable environment; biodiversity and environmental resilience; the indispensable participation of society in debates on the environment; the application of the Precautionary Principle to current EIAs; and the proposal for its application in health impact assessments.

The interrelationship between man and the environment

The environment

The current model of environmental exploitation, in pursuit of socioeconomic development, has become unsustainable. It cannot provide for the new requirements of man's relationship with nature subsequent to the scientific and industrial revolution and this is due to the effects of man's action on the environment.

The irrational exploitation of the environment is intimately linked to consumption. It began with industrialization in the nineteenth century and intensified over time up to the present day. Society within the globalized economy encourages unrestricted consumption, prioritizing individual interests in detriment to the collective environmental interest (LEITE, 2010). The disconnection between the economy and nature led to dissociation between the economy and society in its broader sense, in terms of its social, ethical and power aspects.

In this way, the economy influences and conditions institutional relations, organizations and the relationship between countries and citizens (MARTINS, 2004).

From the 1950s onward, a series of environmental disasters were observed throughout the world, causing serious environmental degradation, resulting in illness and even the death of thousands of people who lived in degraded areas and were affected by events such as the oil spill off the northern coast of France, the death of fish in Swedish lakes, the chemical accident in Bhopal, India, and the nuclear disaster at Chernobyl in the Soviet Union. These events brings to the fore the fact that this paradigm of environmental exploitation is not only harmful to the environment, but also to the human beings who live in these areas.

As a result of the United Nations Conference on Environment and Development, held in June 1972 in Stockholm, environmental concerns became an issue of international significance and the responsibility of all countries.

In 1983, the General Assembly of the United Nations (UN) instituted the World Commission on Environment and Development (WCED), also known as the Brundtland Commission. It organized hearings around the world and produced a final report entitled "Our Common Future".

The approval of the Brundtland Report (1987) sought to break with the development paradigm associated to the unrestricted exploitation of natural resources and the exploitation of human beings in the world's poorest regions as a means to economic success.

The United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992, also known as the World Summit or Rio-92, places man at the centre of concerns related to sustainable development by considering human beings as part of the biological diversity within the environment. Rio-92 promoted the struggle for a new sustainable order, in balance with nature, through *Agenda 21* and the *Rio Declaration*.

At the Rio+20 Conference, countries renewed their commitments to sustainable development by affirming the following points: the impetus towards a green economy; the need for a global approach to sustainability; a successor to the Millennium Development

Goals (MDG) through the Sustainable Development Goals (SDG); human development and actions to combat poverty; strategies to fund sustainable development; sustainable production and consumption; support for environmentally clean technologies and the use of new indicators to measure growth.

The environment as a fundamental right of man

Human beings are entitled to a healthy and productive life, in harmony with nature (Principle 1 of the *Rio Declaration*).

To consider the right to the environment as a fundamental human right is to conceive of it as a new epistemological model under which both human existence and quality of life are guaranteed now and for future generations (VULCANIS, 2010). This idea puts into practice the definition of sustainable development presented by the Brundtland *Report* in 1987. Vulcanis (2010) groups together first generation fundamental rights (rights of freedom), second generation fundamental rights (social rights) and third generation fundamental rights (human solidarity rights), within which environmental rights are included.

The principles of environmental rights emerged mainly from the Stockholm Declaration on the Human Environment (1972), together with the principle of prudence or caution, the principle of responsibility, the "polluter pays" principle and the principle of cooperation between states.

The human right to an ecologically balanced environment has been recognized in international conventions and documents since the Rio-92 Declaration. Currently, the right to an ecologically balanced environment, similar to the rights to solidarity, self-determination and peace, is a human right which does not fall either under public nor private law. Environmental goods, therefore, become public goods, regardless as to whether they are publicly or privately owned (SANTILLI, 2010).

The right to the environment is made up of rights which are formally recognized as fundamental rights and rights which are materially fundamental. The 1988 Brazilian Constitution contains a number of implicit and explicit principles, such as the primacy of the environment, limited exploitation of property, the sustainable use of natural resources, the prevention principle, the "polluter pays" and "user pays" principles and the ecological function of property (BENJAMIN, 2007).

Fundamental rights seek human dignity, liberty and equality. Therefore, the right to the environment is contained within the concept of fundamental human rights, given that it aims to promote a decent life for all by preserving the quality of the environment. When scientific knowledge is not sufficiently well armed to guarantee the preservation of the environment, the application of the Precautionary Principle proved to be an effective measure to protect this fundamental human right.

Human living standards within a sustainable environment

Human beings extract essential resources for their survival and socioeconomic development from the environment which also provides for their livelihood. The integrity of

the environment is dependent upon ecological functions essential to life. Environmental resources are defined by the environment's capacity to provide vital physical resources, allowing it to carry out its function as a life support system (SÁNCHEZ, 2006). Degradation alters the environment, it becomes impoverished and, therefore, less capable of providing human beings with vital resources. Moreover, it impacts on ecological functions which are essential to all forms of life. The need to bring order to human activities so that their environmental impacts do not compromise essential life and preserve a finite and exhaustible source of resources is universally understood. It is this understanding that led countries to adopt policies and legislation in accordance to their economic, social and cultural realities.

Environmental concerns stand out in Europe where Environmental Law preceded the European Constitution, whose goal was not just to establish a common market, but also to protect the environment by enshrining in law community competence over environmental matters, so as to ensure sustainable development (CANOTILHO, 2007). In Brazil, Law 6.938/81 sets out the National Environmental Policy. It defines the environment as a set of conditions, laws, influences and interactions of a physical, chemical and biological order which allows for, shelters and governs life in all its forms. The 1988 Constitution evolved from previous Brazilian constitutions. It sets out a "broader" anthropocentric vision. In other words, it guarantees the integrity of the environment for human use (anthropocentrism), while aiming to preserve it for present and future generations.

According to the Brazilian Constitution, responsibility for the quality of the environment is shared between public authorities and citizens. The State has experienced difficulties in applying environmental legislation, given its bias towards unsustainable exploitation and its compact with the unscrupulous custodians of economic power. The alienation of society also plays a part in the misapplication of environmental legislation, given that it is unaware of both the importance of participation and its duty to participate.

The environment as a resource for collective use is referred to as a "macro-good". A "macro-good" is a good of diffuse nature which belongs to everyone. It is neither a public good and even less a private good, belonging instead to an immaterial category, given its characteristics of unavailability, indivisibility and the fact that it cannot be owned (DUARTE, 2008). "Micro-goods" encompass the flora, fauna, water, soil and air. By protecting "micro-good" components the environment as a whole, an immaterial good, is also protected.

The balanced, or "sustainable", use of the environment ensures that human beings are harmoniously integrated with their surroundings, guaranteeing the maintenance of and access to the resources necessary for survival, with leisure activities and public services universally available. Environmental sustainability can be attained by harmonizing the economic, social and cultural activities which take place in this environment.

The protection of the environment enshrined in the Brazilian Constitution renews the rights to the ownership and use of the environment. However, it also considers any use which promotes environmental degradation, compromising present and future generations, as misappropriation (BENJAMIN, 2007). How can environmental sustainability be guaranteed when, using the right to ownership argument, individuals who cause de-

gradation induce environmental changes whose harm to the environment and to human health are as yet unknown? The application of the Precautionary Principle removes the need to prove these effects.

The issue of biodiversity and resilience in environmental use

Biological diversity is the variation of living organisms from all origins and the ecological complexes in which they exist, including diversity within species, between species and of ecosystems (IANNI, 2008). Biodiversity is the relative distribution of species within a given environment in terms of quantity, frequency and density, among other factors. The biodiversity of ecosystems encourages the mediation of matter and energy flows and the continued resilience of the ecosystem in the event of extraordinary circumstances (SETZER *et al.*, 2007). According to the Beijer Institute of Ecological Economics in Sweden, resilience is defined as the amount of disruption that an ecosystem can absorb before fundamental changes to its structure occur, displacing it from a situation of stability. Human activities, such as intense urban development, extensive single-crop farming, the production of waste emissions and the uncontrolled exploitation of flora and fauna reduce biodiversity and cause the loss of resilience, weakening and destabilizing ecosystems. When resilience reaches breaking point, the addition of new human activities can compromise quality of life, and more specifically, the health of human populations. However, how can this acceptable limit of resilience be measured in an environment which has already been exploited by man? In the absence of the technical ability to conduct measurements, applying the Precautionary Principle is a sufficient argument in order to preserve this environment.

Social participation

With the restoration of democracy in many Latin American countries after more than 20 years of undemocratic regimes, civil society sought to take ownership of new spaces for participation. Subsequently, there were significant alterations in the socioeconomic structure of these countries, shaped by economic globalization. The need for social participation is outlined in Principle 10 of the Rio-92 Declaration, also known as the Access Principle. It is the duty of the State to provide public access to information and the opportunity to participate in decision-making. Access to information includes judicial and administrative procedures and any measures taken to compensate possible damages.

Principle 10 was formally adopted in Europe in 1998, when various members of the European Community signed the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters. In April 2008, 40 countries from the European Community and Central Asia had subscribed to this document, which was ratified by more than 40 other countries. Its principles were applied within the European Community's Water Framework Directive (Directive 2000/60/EC).

Article 198, line III of the 1988 Brazilian Constitution had already explicitly established social participation as a directive in health sector services. The application of the

Rio Declaration in Brazil complemented civil society's pursuit of new spaces, encouraged by the Constitution of 1988. Resolution 01/86 of the National Environment Council (CONAMA), in §2, article 11, also foresaw social participation by way of public hearings to debate the content of Environmental Impact Reports.

In this way, the obligation to advertise public acts and public hearings - either in relation to planning or environmental issues such as environmental impact analyses and, more specifically, EIAs - became part of the routine for project planning in general. The inadequate application of the Access Principle is due to the fact that citizens are unaware of their rights and a culture of obfuscation which still persists at public administration level (ACUNÃ, 2009). For the author, greater transparency in public and private management is the starting point in order for the Access Principle to be effectively put into practice. Prioritizing human health impact assessments within environmental impact studies could serve to motivate citizens to participate in public hearings, given that, culturally, health is an issue of more immediate interest to society. The possibility of applying the Precautionary Principle to benefit human health should be widely communicated within society so that potential environmental risks may be fully understood.

The application of the Precautionary Principle in environmental impact assessments

Law 6.938/1981 established the National Environmental Policy and article 9 sets out preventive environmental actions, establishing standards of environmental quality, environmental zoning, the assessment of environmental impact and the licensing and revision of potentially polluting activities. The Environmental Impact Evaluation (EIE) is a proven environmental tool, both for projects involving a physical transformation of the environment, as well as policies and strategic planning (MILARÉ, 2007).

The EIE consists of carrying out a preliminary Environmental Impact Assessment (EIA) and producing an Environmental Impact Report (EIR). The EIA/EIR should be executed in accordance with the standards outlined in CONAMA Resolution 001/86. According to article 6 of this Resolution, the assessment must include an environmental survey covering the physical, biological and socioeconomic context; an analysis of the project's impact and any alternatives; a description of measures for mitigating negative impacts; a follow-up and monitoring program for both positive and negative impacts, outlining the factors and parameters to be considered. Braga *et al.* (2005) summarize the basic schedule which an EIA/EIR should follow, including elements such as general information, description of the nature of the project and the affected area (physical, biological and man-made environment), and analysis of environmental impacts, a proposal of mitigating measures and a program to follow-up and monitor impacts. In terms of the man-made environment, a social analysis of the affected area is proposed, which should include issues relating to health.

Different methodologies are employed to carry out an EIA, where the Checklist and Matrix methods are the most common. The Checklist approach is presented by Sánchez (2006) as being a list of the most common environmental impacts associated with a large number of projects. The Matrix method comprises two lists presented in tabular form.

One contains the project activities and the other the main components and elements of the surrounding environmental system.

Environmental licensing is the series of complex steps (including the approval of the relevant EIA/EIR) which make up the administrative procedure whose purpose is the concession of an environmental license (FIORILLO, 2009). The processes described above are preventive tools to protect the environment, in accordance with article 9 of Law 6.938/81. Through them, potential polluting emissions and remedying measures to neutralize or eliminate their impact on the environment are identified. Prevention is thus characterized by knowing that a proposed new project will harm the environment and human health. Therefore, it should only take place if certain formal, proven measures are carried out starting with the project's conception, through its implementation, to its continued upkeep. Although this preventive measure is enshrined in law, there are still risks to the environment due to the occurrence of unforeseeable events or the inappropriate execution of measures proposed to eliminate or neutralize the risks of environmental damage.

There are problems in establishing and proving causal links, due to the difficulties presented by causality theories and other obstacles (LEITE, 2010). There are difficulties in establishing scientifically coherent causes and effects (single or multiple causes, environmental complexity, difficulties in providing evidence), in identifying timeframes for the occurrence of damage and in proving the participation of different agents in causing harm (principal and secondary agents, joint liability of those responsible, passive liability). Article 942 of the Civil Code states that the responsibility for collective redress occurs when there is more than one agent responsible for the offence or violation of the rights of others.

Portuguese legislation also recognizes these difficulties, acknowledging in article 5 of Decree-Law 147/2008 the criteria of verisimilitude and probability being applied when evaluating the proof of a causal link between a harmful act and the resulting damage. The interpretation is that, provided it is verisimilar and plausible, the causal link is deemed probable (OLIVEIRA, 2010).

The Maastricht Treaty (1992), in addition to establishing the European Union, approved the Precautionary Principle in European Environmental Law. According to the European Precautionary Principle, when there is uncertainty surrounding the risks that a project poses to the environment, the benefit of the doubt is given to the environment rather than the potential polluter.

The Rio Declaration presents this criterion in Principle 15:

> Principle 15. In order to protect the environment, States must apply the precautionary criterion as widely as possible. When the risk of serious or irreversible damage exists, the absence of absolute scientific certainty should not be used as a reason for delaying implementation of cost-effective measures which will prevent environmental degradation.

The Precautionary Principle is an anticipatory protective measure for the environment and precedes the Principle of Prevention, given that the latter requires proven risks to be eliminated by actions taken before the environmental damage takes place (CANOTILLO, 2007). The institutional enforcement of the reversal of the burden of proof is the most laudable consequence of applying the Precautionary Principle within Brazilian Law. In this way, it is possible to avoid the simple application of article 333, clauses I and II of the Civil Code (SILVEIRA, 2004). Thus, when there is a risk of environmental damage - which could be classed as very serious or even irreversible - the absence of scientific proof of potential damage cannot be used as an argument for accepting activities which could cause environmental degradation. The application of the Precautionary Principle must be considered in the absence of absolute scientific certainty that no environmental harm will be caused, when it is not possible to identify the risks of serious or irreversible damage or when the idea of environmental disruption is unacceptable. The effect of its use results in reversing the burden of proof in legal proceedings, that is, it is the perpetrators of potential damage who must prove that their actions will not harm the environment. This principle may be applied if there is sufficient doubt or uncertainty of environmental damage (ALVES, 2005). If it cannot be proved that the proposed activity will not harm or unacceptably alter existing environmental characteristics, perpetrators must be refrained from carrying out the planned activities.

The project is granted legal status when emissions produced by the activities fall within the standards set by the administrative authority. These standards may change over time and with breakthroughs in science and technology. The legality of the activity is irrelevant, since it does not remove the polluter's responsibility to provide permanent confirmation on whether activities are environmentally harmful. This is the interpretation of Law 6.938/1981, by which the polluter must assume full liability for all risks associated with its activities (MILARÉ, 2007).

The polluter has no grounds for exemption from civil liability, regardless of whether the damage is caused due to exceptional causes, through human or technical fault, or because of unforeseeable natural conditions.

Based on these interpretations, the Precautionary Principle is applied by experts carrying out environmental impact assessments. Its application is also accepted by potential polluters who are concerned by the reach of the law supporting the use of the Precautionary Principle. It can be observed that Brazilian legislation (Brazilian Constitution, 1988; Civil Code, 1973; Environmental Law 6.938, 1981; CONAMA Resolution, 1986), similar to legislation in most countries, pre-dates Rio-92. The formal institutionalization of the Precautionary Principle, as proposed by the Rio Declaration, was not enshrined into the legislation of countries after 1992. A strategy for its insertion into different countries' legislation was not discussed at the Rio+20 Conference. The twenty years following Rio-92 saw a significant evolution in its legal interpretation. Nevertheless, the formal legal adoption of the principle would consolidate its application as standard practice for experts, decision-makers and for society as a whole.

A proposal for the application of the Precautionary Principle in human health impact assessments

In order to conduct EIAs, guidelines stipulate that concerns about the physical and biotic environment, socioeconomic conditions and the welfare of the population in the area affected by the new activity must all be accounted for. Critics of how studies are conducted point to the superficial manner in which the issue of human health is addressed, generally being limited to citing the existing capacity of hospitals and ambulance services. Given that EIA/EIR analyses tends to be carried out by environmental agencies, which generally do not have among their staff experts with specific knowledge on environmental health, the analysis of potential health impacts is not afforded sufficient attention within EIAs. Environmental assessments make little or no mention of human health, because social issues are not a priority in the implementation of public policy (CANCIO, 2008).

In order to meet the requirements of Inter-ministerial Order 419/2011 and Order MS 47/2006 on the evaluation of potential malarial risks and the requirement for a Certificate of Sanitary Conditions when implementing projects in regions where malaria is endemic, Brazilian legislation does exercise the Precautionary Principle to combat the increase of endemic malaria levels. In the specific context of the workplace, the Precautionary Principle is also employed in Occupational Health through the application of Regulatory Norms for Occupational Safety and Medicine, based on a list of illnesses defined by the Ministry of Health's Order 1.339, 18/11/1999 (as highlighted in the NR-15 qualitative assessment annexes).

However, generally speaking, there are no laws or norms linking pollution or changes to the environment with human health impairment. How can this risk to human health be measured? Medical literature reveals which diseases are likely to occur frequently, occasionally or less often and are caused by the presence of an etiological agent within a polluted or altered environment. Our knowledge of the length of human exposure to and the concentration of emissions which are necessary in order to cause diseases changes in accordance with scientific and technological progress. There are doubts over the exact concentration/length of time of exposure required to cause illness. In face of uncertainties, or because of a lack of knowledge among experts contributing to environmental impact studies, it has become accepted practice to exclude the potential occurrence of diseases from these studies.

Chronic diseases are the result of the interaction of many low and moderate level risk factors, rather than one aberrant risk factor (OBERMAN, 1997). Oberman argues that genetic traits relating to particular diseases often result from the influence of a number of genes and the emergence of illness is dependent on environmental factors. For Weinsier (1997), there are four main factors which significantly contribute to public health in the USA: personal lifestyle (behavioral diseases), the environment (diseases linked to water, air, soil and occupation), heredity factors and the system of medical assistance.

The environment remains a constant factor in the life of human beings in relation to the emergence of diseases. For Landrigan (1997), establishing a diagnosis of an occupational or environmental disease can follow the fundamental principles of biological possibility and dose-response.

However, Fletcher *et al.* (1996) argues that in most cases of morbidity and mortality (focusing particularly on chronic diseases) the relationship between exposure and illness is not obvious. This is due to a number of factors such as a long latency period (before the illness manifests itself), frequent exposure to risk factors (do not seem dangerous to society), the low incidence and low risk of disease and whether it is common (risks are already known and new risks are not sought), or the presence of multiple causes and effects.

The application of proposals and methods to link environmental change with potential risks to human health have encountered difficulties, due to the need to *quantify* the intensity of the emission (the dose) that may cause harm to human health, as well as the required length of exposure of human beings to disease-inducing emissions.

Given the lack of clarity over the dose and length of exposure - whether illnesses occur due to single cause or multiple causes, relating to the uncertainty surrounding the effects of an activity on human health - applying the Precautionary Principle seems a reasonable way of preserving human health within a particular environment. The absence of quantitative data cannot exclude presumed environmental causes of diseases from health impact assessments. Given that the Precautionary Principle has been accepted and is applied in studies regarding the preservation of the environment and biodiversity, it should be applied with more emphasis to studies into human health. The lack of adequate research into the impacts on human health in EIAs does not meet the requirements of Federal Law 6.938/81 (referring to pollution), Resolution 01/86 (referring to environmental impact) and Decree 99.274/90 (referring to licensing).

To satisfy the legislation based on the Precautionary Principle, the risk to human health can be measured *qualitatively*. A qualitative assessment of the risk of occurrence of new diseases in an altered environment may be characterized by the different forms of emissions that a project can produce or by changes in human behavior, due mainly to migration, thus making it possible to account for a greater number diseases.

In accordance with the emissions produced and the local population's behavioral changes predicted for a particular project, potential environmental diseases may be classified into water-borne, airborne and land-borne diseases, diseases transmitted by mechanical and biological means, occupational diseases, chronic-degenerative diseases and behavioral diseases.

Behavioral diseases may occur as a result of population increases generated by a project. Estimates can be calculated by foreseeing the number of job vacancies created by the project (multiplied by three, considering an average of three people per family). Based on forecasts of new opportunities available from the socio-economic assessment of the project, the number of predicted job vacancies can be similarly accounted for and added to the projections of population increases. From these results, the percentage increase from the existing population can be deduced. It is important to consider the specific ethnic make-up of the resident population and whether populations are protected by government programs or are economically and socially fragile. In such cases, the slightest increase in the number of people could result in a greater social interference for the native population and must be considered as being of higher risk.

The least desirable scenario is that of a newly degraded environment. It creates the conditions to potentially increase the spreading of existing diseases and/or when a significant number of migrants carry existing diseases to the changed environment which offers suitable conditions for diseases to spread. This situation will be even more detrimental to the health of the local population if a disease did not exist in a particular locality and environmental alterations or migratory influx resulted in the potential appearance of new diseases.

The emissions forecast as a result of running a project can only be measured after its implementation. By applying the Precautionary Principle, any emission resulting from a particular activity is considered a risk to human health. Thus, its application precedes the measurement of the dose or length of exposure to causal factors which takes place subsequent to environmental alteration.

Final considerations

It is essential that there is information available on the potential risks to human health when specific activities are set to alter an environment. This must be the case, given that changes to an ecosystem may damage human health, that the resilience of this environment may already have reached its absolute limit and that the constitutional protection of the environment aims to guarantee environmental quality. This is all the more necessary when society plays an active role in debates on the preservation of environmental quality. Although the exact intensity of a particular risk may be unknown, due to one or many causal factors, and the precise length of exposure may be unclear, by applying the Precautionary Principle environmental diseases which may occur as a result of environmental alteration can be identified.

By including this information in a Health Impact Assessment within the EIA, decision makers - using the Precautionary Principle - may be able to better evaluate the risks posed to all forms of life and, above all, human life.

The application of the Precautionary Principle to environmental impact assessments got off to a timid start after Rio-92. A lack of consensus within the business community over its relevance ended up in the courts, where the case was ruled in favor of its application. The adoption of the Precautionary Principle by Environmental Law motivated experts to employ it more widely in situations where its application was relevant. It was hoped that Rio+20 would have concretely reaffirmed the importance of using the Precautionary Principle in the preservation of the environment over the past twenty years and clarified its use in new legislation. Its non-inclusion in the Rio+20 documents makes its use in environmental impact assessments dependent on the judicial interpretation of each case. The current poor quality of human health impact assessments could be remedied with the formal application of this Principle in these assessments. There is no doubt that the context, motivations and focus of the Rio+20 Conference were different to those of Eco-92. Official decisions were more general and the so-called global crisis ensured that the "green economy" became the linchpin of the Conference. However, the demands of society remained as vivid as they had been at Eco-92, highlighting to the "academic"

community issues which were still unresolved and which need to be examined in more detail, such as the Precautionary Principle in human health impact studies. These issues may once again be taken up during the discussions to define the Sustainable Development Objectives (SDO), which are due to take place over the next couple of years. This will be an opportunity to include an assessment of the application, over the past twenty years, of the Principles of the Rio Declaration, and in particular, the Principle of Precaution, as well as strategies for strengthening these Principles to the benefit of all life forms.

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THE PRECAUTIONARY PRINCIPLE IN BRAZIL POST-RIO-92: ENVIRONMENTAL IMPACT AND HUMAN HEALTH

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Resumo: A preservação da qualidade ambiental, apesar de ser um princípio de reconhecimento universal, a agressão ao ambiente é uma realidade que provoca danos de difícil reparação ao próprio e à saúde humana. Na *Declaração do Rio*, fruto da Conferência Rio-92, apresenta-se a proposta de utilização do Princípio da Precaução – que é aplicado em muitos estudos atuais, - como instrumento antecipatório da prevenção na avaliação do impacto ambiental. Este artigo discorre sobre o uso do Princípio da Precaução para os estudos de impacto à saúde, na incerteza da licitude da atividade desenvolvida, e da necessária dose, tempo de exposição, da causa única ou da multicausalidade das doenças que podem ocorrer devido à alteração ambiental.

Palavras-chave: Princípio da precaução; Dano ambiental; Estudo de impacto ambiental; Estudo de impacto na saúde humana.

Abstract: Although preservation of environmental quality is a universally recognized principle, harming the environment is a reality that causes damage, which is difficult remedy, both to the environment and human health. The Rio Declaration, which resulted from the Rio-92 Conference, recommends the application of the Precautionary Principle as an anticipatory prevention tool in environmental impact assessments. Since then, the Precautionary Principle has been used in environmental assessments when current scientific knowledge is faced with uncertainties. However, these assessments/studies often present an incipient approach relating to impacts on human health which do not consider the Precautionary Principle. This work proposes the application of the Precautionary Principle in human health assessments when there is uncertainty over the legitimacy of activities being developed, the length of exposure to and dose of emissions, and over single or multiple causes of diseases that may occur as a result of an environmental alteration.

Keywords: Precautionary principle; Environmental harm; Environmental impact assessment; Human health impact assessment

Resumen: La agresión al medio ambiente puede provocar daños de difícil reparación al medio ambiente y a la salud humana. En la Declaración de Río, la propuesta es utilizar el "Principio de Precaución" como instrumento anticipatório de la prevención en la evaluación del impacto ambiental. Desde entonces, el "Principio de Precaución" ha sido aplicado en muchos estudios cuando se enfrenta con lo imprevisible en el conocimiento científico actual. Sin embargo, estos estudios muestran en general un enfoque incipiente sobre el impacto en la salud humana, excluyendo la aplicación del principio de precaución. Este trabajo propone el uso del "Principio de Precaución" para los estudios de impacto en la salud, en la incertidumbre de la legalidad de la actividad realizada, en la incertidumbre de la dosis necesaria, en el tiempo de exposición, en la causa única o múltiples causas de las enfermedades que pueden ocurrir debido a los cambios ambientales.

Palabra clave: Principio de precaución; Daños ambientales; Estudio de impacto ambiental; Estudio del impacto en la salud humana.